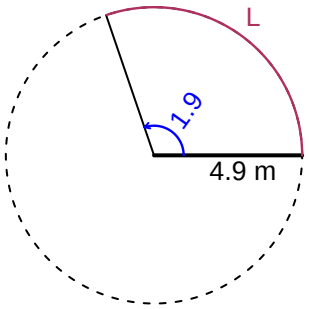
Name: Date:

Trig Final (Solution v5)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 4.9 meters. The angle measure is 1.9 radians. How long is the arc in meters?

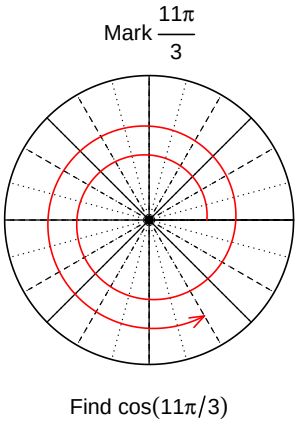


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

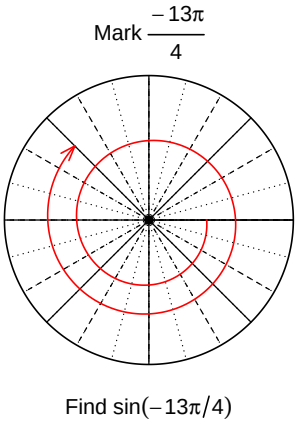
$L = 9.31$ meters.

Question 2

Consider angles $\frac{11\pi}{3}$ and $\frac{-13\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{11\pi}{3}\right)$ and $\sin\left(\frac{-13\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\cos(11\pi/3)$



Find $\sin(-13\pi/4)$

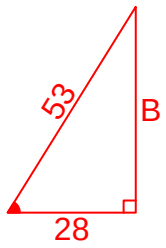
$\cos(11\pi/3) = \frac{1}{2}$

$\sin(-13\pi/4) = \frac{\sqrt{2}}{2}$

Question 3

If $\cos(\theta) = \frac{28}{53}$, and θ is in quadrant IV, determine an exact value for $\tan(\theta)$.

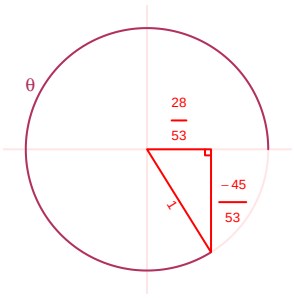
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$28^2 + B^2 = 53^2$$
$$B = \sqrt{53^2 - 28^2}$$
$$B = 45$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\tan(\theta) = \frac{\frac{-45}{53}}{\frac{28}{53}} = \frac{-45}{28}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 4.35 Hz, an amplitude of 5.75 meters, and a midline at $y = 2.06$ meters. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 5.75\sin(2\pi 4.35t) + 2.06$$

or

$$y = 5.75\sin(8.7\pi t) + 2.06$$

or

$$y = 5.75\sin(27.33t) + 2.06$$